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Spontaneity and Control: Friedrich Hayek, Stafford Beer, and the Principles of Self-Organization

Max Hancock 

Centre for Research in the Arts, Social Sciences, and Humanities, University of Cambridge; Committee on International Relations, the University of Chicago
E-mail: maxfieldh@uchicago.edu

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Friedrich Hayek, the Austrian economist, and Stafford Beer, best known for engineering socialist Chile's CYBERSYN project, met exactly once, at the 1960 Symposium on the Principles of Self-Organization, hosted by the Biological Computer Laboratory at the University of Illinois. Independently, in the decade that followed, Beer and Hayek each sought to apply the principles of self-organization to the design of economic institutions. They were joined in the belief that the full enjoyment of human liberty would require a self-organizing world economy. To understand why, this article delves into the explanatory logic and intellectual history of "self-organization." I use points of convergence between Beer's thought and Hayek's to reframe a key moment in the history of neoliberalism.

Introduction

Daphnia, better known as water fleas, are aquatic crustaceans that range from one to five millimeters in length. They dwell in open bodies of fresh water on every continent except Antarctica. In 1962, the left-wing systems theorist and operations researcher Stafford Beer discovered that *Daphnia* possess an aversion to "tiny magnets."

How did Beer arrive at this conclusion? First, Beer transplanted a colony of *Daphnia* to a fish tank and gave the creatures dead leaves to eat. Next, he snuck iron filings small enough for *Daphnia* to ingest into the leaves. Beer waited until his *Daphnia* had swallowed the iron pieces, then placed the aquarium in an electromagnetic field. Beer planned to read out changes in the electrical characteristics of the phase space produced by the colony's spontaneous response to the electromagnetic charge. "However," Beer was forced to admit, "there were many experimental problems. The most serious of these was the collapse of any incipient organization—apparently due to the steadily increasing suspension of tiny permanent magnets in the water."¹ Beer's crustaceans excreted magnetized iron

¹Stafford Beer, "A Progress Note on Research into a Cybernetic Analogue of Fabric," April 1962, BCL Contract and Conference File, Box 1, UIUC University Archives, Urbana, IL.

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filaments into their surroundings faster than Beer could fool them into swallowing more iron.

Beer's *Daphnia* were unwitting participants in a project which commenced two years prior at the 1960 Symposium on the Principles of Self Organization (hereafter the 1960 Symposium) hosted by the Biological Computer Laboratory (BCL) at the University of Illinois. The symposium drew a coterie of cybernetics researchers and social theorists with a shared interest in the emergent properties of complex systems to the grounds of a Gilded Age mansion on the outskirts of Champaign. That weekend, Stafford Beer delivered a presentation titled "Towards the Cybernetic Factory," which was attended by none other than Friedrich Hayek, the fabled Austrian economist, who had taken the train down from his post at the University of Chicago. Beer, later famed for engineering central planning in socialist Chile, and Hayek, a free-marketeer par excellence, left remarkably positive first impressions on one another (see Fig. 1). The same evening Beer presented his research, he wrote in his diary, "I was most gratified by the reaction of that eminent economist, Dr. Hayek, who thinks that this approach to the economic structure and control of industrial companies is a revelation compared with the classical modes of analysis."²

This article's central claim is that Hayek, the market liberal, and Beer, the central planner, shared a philosophy of knowledge and control, predicated on the notion that complex systems achieve competitive equilibrium spontaneously. Whereas Eden Medina's book *Cybernetic Revolutionaries* locates "deep conceptual similarities between Beer's work in management cybernetics and [Allende's political party] Popular Unity's approach to democratic socialism,"³ this article finds similarities between Beer's work and the work of Friedrich Hayek—the economist who, Greg Grandin writes, "served as the true inspiration for Chile's capitalist crusaders."⁴ Beer was not a formative influence on Hayek, nor Hayek on Beer. Rather, I show that a shared set of epistemological commitments distinguished Hayek from other economists and Beer from other cyberneticists.

In a 2023 article, Nicholas Mulder suggests that recent work on the origins of neoliberalism has a philosophy-of-history problem. "Why," he asks, "have historians accorded high theory a central role in the neoliberal revolution?"⁵ This article answers Mulder's call to explore "neoliberalism's affinities with diverse strands of politics, from socialism and libertarianism to authoritarianism and nationalist democracy." My aim is twofold: first, to add to the body of work showing that disembedded market forces did not blanket the planet, toppling left-wing governments and eliminating barriers to trade all on their own. The same spontaneity that (in triumphalist accounts) was rocket fuel for the free-market revolution flamed inside Popular Unity's democratic socialism. And yet it was neoliberals' views that became hegemonic in the 1970s, not Allende's. Politicians and soldiers in Chile and

²Stafford Beer, *How Many Grapes Went into the Wine? Stafford Beer on the Art and Science of Holistic Management* (Hoboken, 1994), 295.

³Eden Medina, *Cybernetic Revolutionaries* (Cambridge, 2011), 40.

⁴Although it was Hayek's University of Chicago colleague, Milton Friedman, who trained Pinochet's cabinet. Greg Grandin, *Empire's Workshop* (New York, 2021), 204.

⁵Nicholas Mulder, "The Neoliberal Transition in Intellectual and Economic History," *Journal of the History of Ideas* 84/3 (2023), 559–83, at 581.



Fig. 1. The 1960 Symposium. Hayek, second from the right, third row from the top; Beer, fourth from the right, top row; von Foerster, first from the right, bottom row. In George Zopf, ed., *The 1960 Symposium on the Principles of Self-Organization* (London, 1961), ii.

Washington bear responsibility for deposing Allende and making the world over in the image of private capital, not the bordering-on-mystical properties that some economists impute to free markets.⁶

Second, to furnish evidence for Mulder's claim: "We must take a realistic view of the role of ideas in history if we want to form reasonable expectations of future change."⁷ On this point, Mulder quotes Julian Germann, who observed in *Unwitting Architect*, "The kind of social and world order change that we imagine it will take to displace neoliberalism is unlikely to occur because it never generated neoliberalism in the first place."⁸ Hayek and Beer shared a philosophy of knowledge and control—this finding is significant insofar as it illustrates how one political order may wholly usurp another, leaving the old order's ideas intact.

This article is not the first to take up Hayek's work on "self-organization" as such. In her 2008 book *Life as Surplus*, Melinda Cooper mounts an inquiry into the "complex models of self-organization proposed by Friedrich Hayek." "[I]t is these theories," she argues, "that have exercised the greatest influence on the political and social forms of neoliberalism."⁹

⁶Jonathan Haslam, *The Nixon Administration and the Death of Allende's Chile* (New York, 2005); Grandin, *Empire's Workshop*; Sebastian Edwards, *The Chile Project* (Princeton, 2023).

⁷Mulder, "The Neoliberal Transition in Intellectual and Economic History," 582.

⁸Julian Germann, *Unwitting Architect: German Primacy and the Origins of Neoliberalism* (Stanford, 2019), 198–9.

⁹Melinda Cooper, *Life as Surplus: Biotechnology and Capitalism in the Neoliberal Era* (Seattle, 2008), 9.

In addition, Ulrich Witt has written that Hayek “read widely on new developments in systems theory, cybernetics, and the biophysics of self-organization.”¹⁰ In Witt’s account, Hayek took an interest in self-organization because it was consonant with Hayek’s own theory of market self-regulation. Hayek’s research “led him to the conclusion that the spontaneous order arising from the interactions in free markets is a case of ‘emergence’ in the sense of the theory of self-organizing systems by R. Ashby [present at the 1960 Symposium], H. von Foerster [the director of the BCL, responsible for organizing the 1960 Symposium] and N. Wiener.”¹¹ Witt adds, “Based on this insight, he claimed intellectual precedence for the discovery of the idea of self-organizing systems for Scottish social philosophy.”¹²

Witt echoes Philip Mirowski, who has observed that Hayek “filtered various cyborg themes into economics at second- and third-hand, motivated to search them out by his prior commitment to the metaphor of the market as a powerful information processor.”¹³ The same may be said of Hayek’s interest in the life sciences. Naomi Beck has shown that Hayek borrowed concepts that, he believed, affirmed the invisible-hand hypothesis, and that he discarded the rest. His engagement with evolutionary theory, Beck concludes, “was motivated by a desire to justify a specific worldview rather than explain observable reality.”¹⁴ This supports my findings. If indeed Beer’s presentation struck Hayek as a “revelation,” it was because the economist found Beer’s views reconcilable with his own.

Nor is this article the first to show that Hayek and Beer crossed paths at the University of Illinois. Evgeny Morozov wrote about the 1960 Symposium in a 2014 article, noting that Beer recorded his encounter with Hayek in his diary. In addition, Pamela Lee wrote about Beer, Hayek, and the 1960 Symposium in *Think Tank Aesthetics*.¹⁵ This article takes the 1960 Symposium as a starting point—my unique contribution is a mapping of the philosophical commitments that Hayek and Beer had in common, which drew both men first to the 1960 Symposium and later to Chile.

In the following section, I introduce this article’s protagonists, whom I call “self-organizers.” They comprise Hayek, Beer, and a cast of researchers from the fields of biology, robotics, and systems theory, clustered around the British cybernetics community and the BCL in Illinois. Afterwards, I draw out self-organization’s formal properties and explain its appeal. Hayek and Beer were fascinated by the emergent properties of complex systems. They agreed that the economy’s ordering forces transcended human understanding, and that those ordering forces were the same forces that patterned the emergent properties of biological life. So, in spite of their differences, each theorist found “self-organization” to be a useful explanatory paradigm. Self-organization substituted microcosm and macrocosm (what Foucault

¹⁰Ulrich Witt, “Competition as an Ambiguous Discovery Procedure: A Reappraisal of F. A. Hayek’s Epistemic Market Liberalism,” *Economics and Philosophy* 29/1 (2013), 121–38, at 126.

¹¹Ibid., 126.

¹²Ibid.

¹³Philip Mirowski, *Machine Dreams* (Cambridge, 2002), 238.

¹⁴Naomi Beck, *Hayek and the Evolution of Capitalism* (Chicago, 2018), 156.

¹⁵Evgeny Morozov, “The Planning Machine,” *New Yorker*, 13 Oct. 2014, at www.newyorker.com/magazine/2014/10/13/planning-machine; Pamela Lee, *Think Tank Modernism* (Cambridge, 2020).

termed a hermeneutics of resemblance) for cause and effect, creating new possibilities for analysis.¹⁶

I show that, for self-organizers, the whole world was at hand. Beer and Hayek proposed to organize the planet under the sign of self-organization. Self-organization's explanatory logic was bounded by biological life, at its most microscopic scale, and the globe, at its most panoramic. In between, in Beer's thought and Hayek's, resemblance joined every class of self-organizing phenomenon. Emergent biological, economic, and social orders echoed one another, harmonizing fish tanks, firms, and life on Earth. I end the article in Chile (with reference to secondary sources), where Beer's work and Hayek's collided.

Self-organizers

The centerpiece of Beer's presentation at the 1960 Symposium was the schematic of a fully automatic factory. At the time of his visit to Champaign, Beer enjoyed some minor fame as the recently appointed head of United Steel's Department of Operations Research and Cybernetics in England, and by 1960 the possibility of a fully automated "lights-out" factory had become rather a *cause célèbre* in the United States. The lights-out factory would dispense entirely with human labor. Sophisticated machinery would select and advance materials from one station to the next across a fully automated assembly line.

Automating the factory floor was all well and good. However, Beer argued, to survive in a competitive market environment, the automatic factory would require a brain:

When men have been almost eliminated from the factory, and it runs smoothly and efficiently by automatic regulation, error-controlled feedback, and programmed response to a specified and limited variety of situations, we have the living organism of the company as the analog of, say, an animal whose nervous system stops at the cerebellum ... This will not do. The spinal dog is short of a built-in cerebrum; and the automatic factory is short of a built-in brain. The research discussed in this paper is directed towards the creation of a brain artefact capable of running the company under the evolutionary criterion for survival.¹⁷

Cue crustaceans. "The most valuable lead in my own mind," Beer continued, "concerns the use of organic systems. I now speak boldly of animals themselves."¹⁸ Beer stipulated that engineering a suitable brain would require harnessing the factory to a homeostatic colony of animal life. In a 1962 "Progress Note" that Beer distributed to the symposium's attendees, he recounted his ill-fated *Daphnia* experiment and

¹⁶Under these conditions, "to search for a meaning is to bring to light a resemblance. To search for the law governing signs is to discover the things that are alike." Michel Foucault, *The Order of Things* (New York, 2002), 29–30.

¹⁷Stafford Beer, "Towards the Cybernetic Factory," in George Zopf, ed., *The 1960 Symposium on the Principles of Self-Organization* (London, 1961), 25–89, at 27–8.

¹⁸*Ibid.*, 76.

named several more candidates for incorporation into his economic control mechanism:

I was led to consider various kinds of animal, and various sorts of language (by which I mean intercommunicating boxes, ladders, see-saws, cages connected by pulleys and so forth). Rats and pigeons have both been closely studied for their learning attributes, both as individuals and as groups ... By the same token, bees, ants, termites, have all been systematically considered as components of self-organizing systems.¹⁹

Beer's objective was to marshal the emergent, self-organizing properties of living things to create a strange, new type of device.

Beer's "brain artefact" would make high-level production decisions in the context of the automatic factory. In Beer's scheme, a colony of living things receives a signal (an electromagnetic charge, in the case of *Daphnia*) that encodes the sum of the information available to factory owners and entrepreneurs. The control mechanism transmutes economic data into sense data. The creatures' spontaneous response to changes in the market, which they perceive as changes occurring in their environment, determines the "behavior" of the automatic factory. Hence the importance of the mechanism Beer designed to monitor changes to the phase space that his magnetized *Daphnia* produced.

Beer prepared a schematic to illustrate his proposal (see Fig. 2). The factory's assembly lines, machinery, balance sheet, and raw materials appear in the top half of Beer's schematic as a constellation of circles and squares. Underneath, arrivals, departures, supply, and demand functions change states and circulate through the "homeostat loop." The brain artefact is located within the circle which reads "algedonic control" (control through the application of either pleasure or pain). Beer's economic control mechanism created a feedback loop, which in his words "set up a homeostatic relationship between the controller and the world."²⁰

Through trial and error, Beer believed, it was possible at scale to train homeostatic control mechanisms to achieve specific distributive-justice outcomes, including socialism. Beer shared in a 2001 interview, "politically, I was always left. I was a socialist and still am."²¹ Karl Marx quipped that "a bee puts to shame many an architect in the construction of her cells. But what distinguishes the worst architect from the best of bees is this, that the architect raises his structure in imagination before he erects it in reality."²² Beer believed in the possibility of administering a futuristic socialist command economy but saw that it would require leaving essential tasks to the bee.

In a letter, Beer described the Symposium on the Principles of Self-Organization as "by far the most intellectually stimulating and humanly enjoyable meeting I have

¹⁹Ibid.

²⁰Ibid.

²¹Albert Müller and Karl H. Müller, *An Unfinished Revolution? Heinz von Foerster and the Biological Computer Laboratory, BCL, 1958–1976* (Vienna, 2007), 61.

²²Karl Marx, *Capital*, vol. 1 (Moscow, 1965), 127.

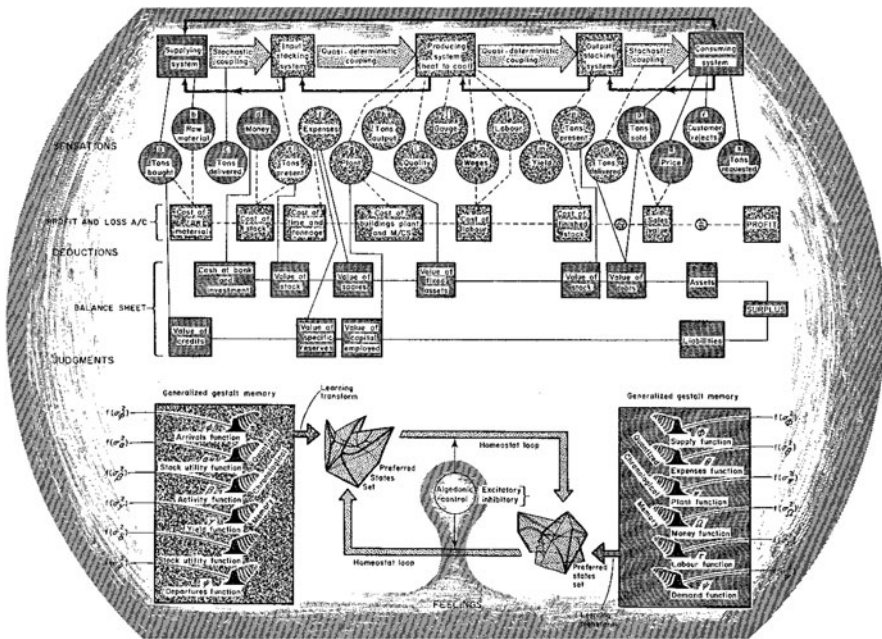


Fig. 2. Beer's blueprint for the automatic factory. Stafford Beer, "Towards the Cybernetic Factory," in Zopf, *The 1960 Symposium*, 25–89, at 80.

ever attended.”²³ The weekend's events left just as strong an impression on Beer's colleagues. The cybernetic factory was a minor sensation.²⁴ As word of Beer's brain artefact spread, the BCL fielded requests for the text of Beer's presentation from IBM, RCA, the National Cash Register Company, the Ford Instrument Company, Sperry Electronics, the Bendix Corporation, the Hallicrafters Company, and Information Systems, Incorporated. “I am interested in the proceedings of the Symposium on Principles of Self-Organization Theory and Technology of Self-Organizing Systems,” R. W. Bemer, a corporate manager at IBM wrote to von Foerster in 1962. “Do you plan to publish? If so, how may I obtain a copy? If you do not plan to publish the proceedings, I am most anxious to get a copy of the talk by Stafford Beer entitled, ‘Towards the Cybernetic Factory.’”²⁵

²³Stafford Beer to Heinz von Foerster, 15 March 1962, BCL Contract and Conference File, Box 1, UIUC University Archives, Urbana, IL.

²⁴The transactions of the 1960 Symposium also influenced the Polish fiction writer Stanislaw Lem. In 1961, London-based Pergamon Press published a short run of copies of the transactions of the symposium to distribute to attendees, complete with diagrams and transcriptions of the discussions that followed each presentation. In 1964, Lem published a collection of essays titled *Summa Technologiae*, in which he wrote explicitly about Stafford Beer's factory and made unattributed references to debates that occurred in the question-and-answer portion of Beer's presentation at the 1960 Symposium. See Stanislaw Lem, *Summa Technologiae* (Minneapolis, 2014), 80.

²⁵R. W. Bemer to the University of Illinois, 22 Sept. 1962, BCL Contract and Conference File, Box 1, UIUC University Archives, Urbana, IL.

Then, in 1969, the Mansfield Amendment prohibited the Defense Department from funding research that lacked clear military applications. In the years that followed, funding for cybernetics research in the US slowed to a trickle. The BCL was not spared—in 1976, the Office of Naval Research found that the BCL produced more waste than it was worth, and the laboratory met the fate of Beer's *Daphnia*. But Beer remained wedded to the principles of self-organization for the remainder of his career. Self-organization became the foundation of the “viable system model” that Beer applied in Chile and later pitched to left-wing governments in Uruguay, Venezuela, and Mexico.²⁶

Beer's presentation provoked strong feelings in his audience members. “Your brain, it seems, has no religion,” a doctor in attendance protested. “You did say at one point the whole thing was only for survival, or homeostasis, but does it want to be evil or good?”²⁷ Hayek, if Beer's diary is to be believed, was no exception.

In a letter addressed to the BCL's director, Heinz von Foerster, in the months prior to the Illinois symposium, Hayek had thanked the director of the BCL for the invitation to speak at the 1960 Symposium and proposed two different lectures:

Thank you for your letter of the 21st (which reached me only today) and the invitation to the proposed conference contained in it. I am greatly interested and, except for a remote contingency, confident that I shall be able to take part.

As regards my positive contribution, that is a more difficult matter. You know that I am not competent and ... most of the technical aspects and my recent thinking has moved largely on the methodological or philosophical problems arising in the field. I could talk briefly on The Causal Determination of Purposive Action and/or Higher Level Regularities ...²⁸

Preliminary conference schedules show that Hayek was given an afternoon slot to present on “1. The Causal Determination of Purposive Action,” and “2. Higher Level Regularities.”²⁹ Hayek pulled his presentation from the schedule at the last minute, citing health issues. “I was in the beginning of a curious ‘illness,’” he confessed in a letter to von Foerster in 1962,

²⁶Beer proposed to give Chilean citizens access to dials, which they could use to transmit how happy or unhappy they felt to Allende's government. Medina writes, “In a handwritten report Beer describes how to build a series of ‘algedonic meters’ [an echo of Beer's schematic for the automatic factory] capable of measuring how happy Chileans were with their government at any given time ... In cybernetic terms, the algedonic meters would serve as a homeostat: they would allow two complex systems, the government and its constituency, to adapt to one another and reach the stable condition of homeostasis.” Medina, *Cybernetic Revolutionaries*, 89–91, 217.

²⁷Beer, “Towards the Cybernetic Factory,” 84.

²⁸Friedrich von Hayek to Heinz von Foerster, 30 January 1960, BCL Contract and Conference File, Box 1, UIUC University Archives, Urbana, IL.

²⁹Preliminary Schedule, BCL Contract and Conference File, Box 1, UIUC University Archives, Urbana, IL.

which deprived me of any real working capacity ... though in retrospect it is something of a joke, it was not so at the time. What happened was that I had suddenly stopped smoking a few days before the conference, and this produced in my case a curious kind of deficiency disease, producing the most puzzling and disturbing symptoms but which disappeared almost overnight when, twelve months later and without yet suspecting the connection, I resumed smoking. I am now as fit as ever.³⁰

Thankfully, Hayek felt well enough to tackle the problem of “higher level regularities” several months later, in a talk that he delivered at the University of Virginia titled “A New Look at Economic Theory.” In the lecture, Hayek described patterns that emerge from relations between people that are not the result of human design. In the case of certain highly complex phenomena, he observed, “all we are able to do is speak about the kind of pattern that will form itself, about a pattern that is defined by certain characteristics or attributes, without being able to specify the detail. I shall say,” Hayek continued, “that all we know in such instances are certain ‘higher level regularities’ but not the detail.”³¹ Of course, he added, “there is perhaps no better illustration of what I mean by higher level regularities than those systems of equations in which mathematical economists describe the conditions of market equilibrium.”³² The characteristics Hayek alluded to belong to the state of affairs in a market economy in which prices correspond to costs—a pattern that organizes itself, in Hayek’s view, which classical theories cannot adequately model.

Independently of one another, Hayek and Beer were committed to applying the principles of self-organization to economic institutions. But the very same emergent properties that became the foundation of Beer’s vision for the future of economic planning inspired Hayek’s case against command economies. Beginning in the 1930s, Hayek argued that the market’s emergent properties delivered economists a knock-down case against central economic planning.

Twenty years prior, in an article titled “Economic Calculation in the Socialist Commonwealth,” Ludwig von Mises had charged that rational economic planning required money valuation and that determining money values required competitive markets in production goods.³³ Beginning in the 1930s, a new generation of “market socialists” took the first charge to heart and set out to disprove the second. Abba P. Lerner, H. D. Dickinson, and Oskar Lange all proposed various “auctioneer” or “trial-and-error” mechanisms that a central planning board, tasked with fixing prices, might employ to mimic market valuation and thereby rationally determine prices.³⁴ Their proposals motivated Hayek, in a series of key articles, to argue that

³⁰Friedrich von Hayek to Heinz von Foerster, 4 April 1962, BCL Contract and Conference File, Box 1, UIUC University Archives, Urbana, IL.

³¹Friedrich von Hayek, “A New Look at Economic Theory: 4 Lectures Given at the University of Virginia, 1961,” in *The Collected Works of F. A. Hayek*, vol. 15, *The Market and Other Orders*, ed. Bruce Caldwell (Chicago, 2014), 373–426, at 381.

³²Hayek, “A New Look at Economic Theory,” 382.

³³Ludwig von Mises, *Collectivist Economic Planning*, ed. Friedrich Hayek (London, 1963).

³⁴Oskar Lange, “On the Economic Theory of Socialism: Part One,” *Review of Economic Studies* 4/1 (1936), 53–71. See also Lange, “On the Economic Theory of Socialism: Part Two,” *Review of Economic Studies* 4/2 (1937), 123–42.

the dispersal of knowledge in society is so complete, and the mechanism by which order emerges from discrete transactions is so opaque, that it is not possible to possess a functional overview of the economy.

Hayek also argued that his interlocutors had failed to account for the division of knowledge in society. “As I have tried to show on another occasion,” he wrote,

it is the main merit of real competition that through it use is made of knowledge divided among many persons which, if it were to be used in a centrally directed economy, would all have to enter the single plan. To assume that all this knowledge would be automatically in the possession of the planning authority seems to me to miss the main point.³⁵

The “main point” was that planning authorities neither possess the sum total of knowledge that entrepreneurs trade on nor are capable of approximating the subjective data that govern the behavior of market participants. Ergo, Hayek wrote, rational economic planning is an oxymoron and socialists cannot hope to replicate the wisdom of the price mechanism.

Later in his career, Hayek used “spontaneous order” to describe these patterns. The term first appeared in Hayek’s *oeuvre* in 1960: “When order is achieved among human beings by allowing them to interact with each other on their own initiative—subject only to the laws which uniformly apply to all of them—we have a system of spontaneous order in society,” he wrote in *The Constitution of Liberty*. He concluded that spontaneous social orders were “the result of adaptive evolution.”³⁶

Hayek credited the nineteenth-century Austrian economist Carl Menger with providing inspiration for the concept.³⁷ In fact, Hayek’s personal friend, the Hungarian philosopher of science Michael Polanyi, coined the term in a 1948 article titled “Planning and Spontaneous Order.”³⁸ Polanyi allied himself with Hayek in the article, which began, “I affirm that the central planning of production—in the rigorous and historically not unwarranted sense of the term—is strickly [*sic*] impossible.”³⁹

Nevertheless, Beer, the central planner, and Hayek, the arch liberal, had more in common than one might expect. Beer and Hayek both admired the work of British cybernetics pioneer Ross Ashby: in 1948, Ashby assembled a device from Royal Air Force bomb control units that detected changes in its environment and adapted its configuration in response. He dubbed the device the Homeostat.⁴⁰ Ashby’s work on feedback and cognition influenced Hayek’s mid-career foray into theoretical

³⁵ Hayek, “Socialist Calculation, the ‘Competitive Solution’,” *Economica* 7/26 (1940), 125–49, at 134.

³⁶ Friedrich von Hayek, *The Constitution of Liberty* (Chicago, 2014), 58.

³⁷ Bruce Caldwell, *Hayek: A Life, 1899–1950* (Chicago, 2022), 109.

³⁸ Struan Jacobs, “Spontaneous Order: Michael Polanyi and Friedrich Hayek,” *Critical Review of International Social and Political Philosophy* 3/4 (2000), 49–67, at 56.

³⁹ Michael Polanyi, “Planning and Spontaneous Order,” *Manchester School of Economic and Social Studies* 16 (1948), 237–68, at 237.

⁴⁰ A colleague of Beer and Pask’s in England, Ashby was present at the 1960 Symposium and a resident at the BCL between 1961 and 1970. Ashby brought the Homeostat with him to the University of Illinois. His daughter, Jill Ashby, wrote in 2008 that the Homeostat was destroyed in a flood in the early 1970s. Jill Ashby, “Biography: W. Ross Ashby (1903–1973),” 2008, at www.rossashby.info/biography.html.

psychology, *The Sensory Order*. Hayek studied Ashby's writing, Paul Lewis has shown, in preparation for the book, which posits a "sensory order" consonant with Hayek's description of the spontaneous order of the market.⁴¹

As a university student, before he turned to economics, Hayek studied physiological psychology. In *Hayek: A Life*, Bruce Caldwell and Hansjörg Klausinger show that *The Sensory Order* began as a student essay, titled "Beiträge zur Theorie der Entwicklung des Bewußtseins" (Contributions to a Theory of How Consciousness Develops), which Hayek wrote in 1920.⁴² In the essay, Hayek challenged Ernst Mach's notion that sense perceptions arise from pure, unmediated sensations. Instead, Caldwell and Klausinger write, Hayek proposed that "each cell in the brain has a vast number of linkages to other cells, that those connections are constantly strengthening and weakening, and that ultimately the sensations we experience are a result of a specific set of firings in this network."⁴³ At the time, he wrote that his findings might have "far-reaching implications for epistemology."⁴⁴

Hayek tried and failed to publish the manuscript in Vienna. Nevertheless, Hayek kept his notes on the topic, and as his fame increased, so did his enthusiasm for epistemology and the study of cognition. During a highly productive period which began at the end of World War II, Hayek returned to the project.⁴⁵ In 1952, he published *The Sensory Order*, which reprised arguments he had formulated as a university student. Cognition, Hayek theorized, emerges spontaneously from the system of neurons and synapses that fire inside each person's brain.

Meanwhile, Ashby's associates at the BCL took to using "homeostat" as a catch-all to describe machines that harnessed the emergent properties of self-organizing systems, biological or otherwise. In 1960, the year Hayek attended Beer's presentation, researchers at the BCL designed a homeostat that operated using fixed circuitry and "artificial neurons" to mimic the adaptive behavior of biological life. Murray Babcock, the doctoral student who oversaw its construction, named the homeostat the ARA—Adaptive Reorganizing Automaton. The ARA was born out of an "attempt to construct an adaptive automaton whose internal structural features are believed to be modeled according to our present limited knowledge of biological nervous tissue."⁴⁶

Beer's account of the 1960 Symposium and Hayek's exchanges with von Foerster indicate Hayek's interest in the research that the BCL led during this period. The ARA provides evidence of the influence that Hayek's theory of the mind, in turn, exercised over BCL engineers. Babcock credited *The Sensory Order* in a technical report that he submitted to the BCL's sponsor, the Office of Naval Research: the

⁴¹Paul Lewis, "Purposeful Behaviour, Expectations, and the Mirage of Social Justice: The Influence of Cybernetics on the Thought of F. A. Hayek," SSRN, prepared for the History of Economics Society meeting, Durham, NC, 2016, 14.

⁴²Bruce Caldwell and Hansjörg Klausinger, *Hayek: A Life* (Chicago, 2022), 129.

⁴³*Ibid.*

⁴⁴*Ibid.*, 130.

⁴⁵*Ibid.*, 588.

⁴⁶Murray Babcock, "Reorganization by Adaptive Automation" (Ph.D. dissertation, University of Illinois, 1960), 1.

ARA's proposed operation, he explained, "is very similar to the operation of the brain as proposed by Hayek."⁴⁷

Hayek's thought was also a touchstone for Heinz von Foerster. Von Foerster began a section which he contributed to the 1993 volume *Grundprinzipien der Selbst-Organisation* (The Basic Principles of Self-Organization) with a quote from the economist: "The only possibility of transcending the capacity of the individual mind is to rely on those super-personal 'self-organizing' forces which create spontaneous order."⁴⁸

Self-organization

Beer and Hayek were attracted to self-organization because neither thought it possible to know the economy completely. In their writing, they approached the topic slantwise, using metaphor. This was possible because, to self-organizers, resemblance linked every stratum of spontaneous social and biological phenomena. Living things, their institutions, and the world they inhabit all mirrored one another.

In Hayek's writing, self-organization is a condition of possibility which suspends individual liberty, markets, and biological life in a unified field. In 1964, he wrote that his work on spontaneous order had

consequences far beyond the field of social theory since it provided the conceptions which made possible a theoretical explanation of the structures of biological phenomena. And in the social field it provided the foundation for a systematic argument for individual liberty. This kind of order which is characteristic not only of biological organisms (to which the originally much wider meaning of the term organism is now usually confined) is an order which is not made by anybody but which forms itself. It is for this reason usually called a "spontaneous order."⁴⁹

The thought of systems theorist and biologist Ludwig Bertalanffy was an important resource for Hayek.⁵⁰ Bertalanffy attended the 1960 Symposium, thanks to an appeal that Hayek delivered to von Foerster in January that year. "I have personally got a good deal of help from Ludwig von Bertalanffy," he wrote in a letter. "He might make a very useful member of such a group; both as a biologist and a philosopher of science."⁵¹

Quinn Slobodian examines Bertalanffy's influence on Hayek in *Globalists*. The essence of Bertalanffy's theory, Slobodian writes, was the proposition that there is "an isomorphism in the objects of study of the various disciplines, such as biology, economics, and psychology. At a basic level, common principles and rules

⁴⁷Ibid., 43.

⁴⁸Heinz von Foerster, *Grundprinzipien der Selbst Organisation*, ed. Karl W. Kratky (Frankfurt am Main, 1990), 383.

⁴⁹Hayek, "Kinds of Order in Society," 459.

⁵⁰Quinn Slobodian, *Globalists* (Cambridge, 2018), 227.

⁵¹Friedrich von Hayek to Heinz von Foerster, 30 January 1960, BCL Contract and Conference File, Box 1, UIUC University Archives, Urbana, IL.

bound all systems of the visible and invisible world.”⁵² Or each arranged order is arranged in its own way; all spontaneous orders are alike. Beer derived his theories from the same set of beliefs (as did his peers at the BCL and in the British cybernetics community; Ashby’s notes indicate that the Homeostat’s working title was “Isomorphism Making Machine”).⁵³

Individual living things anchored self-organizers’ metaphorical systems. Foucault wrote in *The Order of Things* that “one particularly privileged point, saturated with analogies,” exists in epistemic systems of resemblance: “This point is man.”⁵⁴ David Harvey, writing in the 1990s, observed that theorists of his generation began to return to the body, the ancient “measure of all things,” at the moment when they began to lose confidence in modern categories of analysis. “Loss of confidence in previously established categories,” he wrote, “has provoked a return to the body as the irreducible basis for understanding.”⁵⁵ Thirty years prior, Beer and Hayek were equally vexed, and in self-organization’s chain of resemblance, individual members of our species take priority over every other link.

On the left and on the right, biological life was self-organization’s blueprint and “aliveness” was its yardstick. Von Foerster wrote as much in the application he submitted to the Office of Naval Research for conference funds in 1959. “In the last couple of years,” von Foerster explained in his request, “preliminary research results concerned with problems in the areas of artificial intelligence and automation of perception, have identified, with increasing emphasis, a fundamental problem underlying almost all concepts of artificial reproduction of functions associated only with living creatures, namely, the phenomenon of self-organization”:

We observe this process taking place at the very threshold of life in the self-replication of a simple virus, and continuing throughout evolution to manifest itself in its most sublime form, in the mind of creative men. Even evolution itself is a manifestation of this phenomenon. In spite of the ubiquity of self-organization, when we attempt to formulate this process or try to describe it in rigorous terms, it seems to become one of the most elusive concepts ever to confront us. However, it cannot be denied that there are in existence several approaches which seem to give promise that we will eventually come to grips with this important epistemological puzzle.⁵⁶

In part, this was because self-organization’s champions understood their project as a challenge to the second law of thermodynamics and conventional theories of entropy. Bertalanffy wrote to von Foerster two months prior to the 1960 Symposium to propose the following agenda topic: “Irreversible thermodynamics, with the particular consideration of open systems, and the possibility of maintenance and of increase of order in such systems, in contrast to the conventional Second Principle.” Bertalanffy asked von Foerster to consider the “Origin of

⁵²Slobodian, *Globalists*, 227.

⁵³Ashby, “Biography: W. Ross Ashby (1903–1973).”

⁵⁴Foucault, *The Order of Things*, 24.

⁵⁵David Harvey, “The Body as an Accumulation Strategy,” *Society and Space* 16/4 (1998), 401–21, at 401.

⁵⁶Proposal for a Symposium on Principles of Self Organization under Contract No. 1834(21), 14 Dec. 1959, BCL Contract and Conference File, Box 1, UIUC University Archives, Urbana, IL.

Life' from this viewpoint."⁵⁷ Self-organizing complex systems appeared to create order and generate possibilities for work, in apparent defiance of the second law of thermodynamics. The printed transactions of the 1960 Symposium include a foreword: "The large disparity between present accomplishments and possible future achievement by more *man-like* systems, should give the engineer an urgent concern for the subject matter of this Symposium."⁵⁸ Like life on Earth, the success of a self-organizing economy was a function of our species' appetite for circulation, and the collapse of the function meant death.

Beer and Hayek broadened self-organization's scope. After the 1960 Symposium, self-organization could no longer be said to have been "associated only with living creatures." In 1973, Pask acknowledged in *The Cybernetics of Cybernetics* that although, "typically, self-organizing systems are 'alive,'" they "may be embodied in inanimate materials."⁵⁹ Still, in the realm of political economy, self-organizing phenomena remained situated at "the very threshold of life."

Neither Beer nor Hayek wished to liberate self-organizing forces entirely. They both viewed self-organization as a tool for doing things in the world and thought it possible to exercise a degree of control over self-organizing systems. In his essay "Notes on the Evolution of Systems of Rules of Conduct," Hayek asked his readers to consider the "abstract and more complex orders based on a division of labor which we find in such insect societies as those of bees, ants, and termites."⁶⁰ Hayek wrote that "homeostatic control" was possible in these groups, since they were composed of individuals responding to environmental pressures.⁶¹ Rather than control members' actions, he proposed to control the group's milieu.

In this manner, Hayek wrote in a 1964 article titled "Kinds of Order in Society," certain features of spontaneous orders could be harnessed, and their emergence could be planned. The article appeared in the pages of the *University of Chicago New Individualist Review*, alongside short pieces by the likes of Murray Rothbard, Milton Friedman, George Stigler, Ludwig von Mises, and Wilhelm Roepke.

The forces that pattern the abstract features of spontaneous orders may be impossible to know, Hayek explained, but they could still be put to good use:

If we understand the forces which determine such an order, we can use them by creating the conditions under which such an order will form itself ... The "ordering forces" of which we can make use in such instances are the rules governing the behavior of the elements of which the orders are formed.

⁵⁷Ludwig von Bertalanffy to Heinz von Foerster, 6 April 1960, Heinz von Foerster Papers, UIUC University Archives, Urbana, IL.

⁵⁸Heinz von Foerster, "Foreword," in Zopf, *The 1960 Symposium*, v, added emphasis.

⁵⁹Gordon Pask, "Self-Organizing System," in Heinz von Foerster, *The Cybernetics of Cybernetics* (1973), Files 143–6, Biological Computer Laboratory Publications Digital Surrogates, <https://digital.library.illinois.edu/items/2504bc20-2c83-0136-4d81-0050569601ca-5>, 231.

⁶⁰Friedrich von Hayek, "Notes on the Evolution of Systems of Rules of Conduct," in Hayek, *The Market and Other Orders*, 278–92, at 281.

⁶¹*Ibid.*, 282.

They determine that each element will respond to the particular circumstances which act on it in a manner which will result in an overall pattern. Each of the iron filings, for instance, which are magnetized by a magnet under the sheet of paper on which we have poured them will so act on and react to all the others that they will arrange themselves in a characteristic figure of which we can predict the general shape but not the detail.⁶²

Beer, who shared Hayek's fascination with the motor properties of iron filings, agreed that it was possible to exercise homeostatic control over self-organizing complex systems in cases where the control mechanism was "an appropriate homomorphism"—meaning in cases where the control mechanism was also self-organizing.⁶³ "International affairs ... *Amoeba proteus* and *Homo sapiens*," Beer remarked, "have this in common."⁶⁴ Beer wrote in his "Progress Note" that the "essence" of homeostatic control was that "the outputs of a world situation are fed as inputs into a control mechanism, which in turn feeds its output into the world situation."⁶⁵

In Hayekian terms, Beer's goal in the first half of the 1960s was to create and train spontaneous orders. His research in the field was not limited to his experiments with *Daphnia*. In 1958, Beer and his colleague Gordon Pask collaborated to build a novel type of electrochemical system in Pask's London apartment. Pask and Beer suspended electrodes in a ferrous solution and subjected the solution to a current. Iron threads began to form between the electrodes, altering the electrodes' potentials. Threads wavered, combined, and dissolved. But over time, neighboring unstable threads tended to amalgamate and grow into stable, resilient structures. Pask and Beer discovered that the thread structures adapted to and withstood serious disturbances, which they simulated by dangling a microphone out of Pask's window to capture the sounds of London traffic and playing the sound at high volume, inches away from the solution. Pask was delighted: "We have made an ear," he wrote, "and we have made a magnetic receptor."⁶⁶

Beer was fond of citing his and Pask's experimental design to illustrate the adaptive properties of self-organizing systems. At the 1960 Symposium, he declared that a suitable economic control mechanism

must be enabled to construct its own components, and this fluid and evolutionary, self-designing process should not be irreversible ... None of these activities needs to be a linear function, nor even a definable function, of input. The whole assembly is a black box, and it needs no designing. In it solutions to problems simply grow, as Pask's metallic threads grow.⁶⁷

⁶²Hayek, "Kinds of Order in Society," 460.

⁶³Stafford Beer, "The World, the Flesh, and the Metal," *Nature* 205/4968 (1965), 223–31, at 227.

⁶⁴*Ibid.*, 228.

⁶⁵Beer, *How Many Grapes Went into the Wine?*, 3.

⁶⁶Peter Cariani, "To Evolve an Ear: Epistemological Implications of Gordon Pask's Electrochemical Devices," *Systems Research* 10/3 (1993), 19–33, at 22.

⁶⁷Beer, "Towards the Cybernetic Factory," 84.

It is plausible that Beer's talk inspired the analogy that Hayek drew, four years later, in the pages of the *University of Chicago New Individualist Review*.

If it is the case that Hayek was impressed with Beer's factory, it should come as no surprise. Neither was satisfied with cybernetics research which could only account for orders created by fixed rules structures. Gabriel Oliva has observed that, in Hayek's view, "Changes in the environment ... sometimes require changes in the structure of rules of conduct if the order of the whole is to be preserved."⁶⁸ Linear functions, that is, are insufficient to the task of adaptive evolution—sometimes it is necessary to grow an ear. Faced with enormous, dispersed sums of information, self-organizers rejected top-down administrative techniques in favor of collective, spontaneous responses and the ineffable, high-level patterns they display.

Beer proposed an astonishing technological solution to Hayek's problem of dispersed knowledge. The new biological paradigm in computing (still embryonic at the time Beer wrote) displaced the human planner and treated economic affairs as a black box, making it possible to imagine a qualitatively different technique for economic planning—immune to the argument that Hayek developed in the 1930s.

Self-organization was appealing to Beer and Hayek because the economy struck both theorists as a poor fit for the social sciences' classical, cause-and-effect mode of explanation. They believed that the economy displayed an order superordinate to its parts and that it consequently defied analysis.⁶⁹ They did not think it possible to possess complete knowledge of the economy's component parts and laws of motion. To make truth claims about the economy, Hayek and Beer made claims about the order that patterned the economy's emergent properties (what Hayek termed its "higher level regularities") and the smaller and larger orders that it resembled.

Classical analysis requires a sequence of causes and effects, which in the case of emergent phenomena may be impossible to discern. In its place, all that self-organization requires is resemblance. Self-organization rejected cause and effect in favor of microcosm and macrocosm, braiding the economy, cognition, and the homeostatic properties of biological life. The biological computer, in that regard, was a useful thing with which to think—a market device for market mystics.⁷⁰

A world to self-organize

Whereas Hayek and his allies fought to shield private capital from democracy, Beer found himself in the employ of the western hemisphere's first elected socialist president. There was one thing that these two men had in common, which they owed to

⁶⁸Gabriel Oliva, "The Road to Servomechanisms: The Influence of Cybernetics on Hayek from the *Sensory Order* to the Social Order," CHOPE Working Paper No. 2015–11, 35.

⁶⁹Zopf, *The 1960 Symposium*, 25.

⁷⁰Michel Callon, Yuval Millo, and Fabian Muniesa developed the notion of "market device" in 2007 to refer to "the the material and discursive assemblages that intervene in the construction of markets." The biological computer's "black box" qualities distinguish it from the devices that Callon, Muniesa, and Millo offer as examples, which range from financial charts to derivatives and fishing quotas. Michel Callon, Yuval Millo, and Fabian Muniesa, "An Introduction to Market Devices," *Sociological Review* 55/2 (2007), 1–12, at 1.

the system they shared for making meaning of social and economic phenomena: they both proposed to organize the planet on their terms.

Every year since 1961, the Canadian Broadcasting Corporation (CBC) has selected a distinguished public figure to deliver the Massey Lectures, a five-part series of talks on the speaker's area of expertise. Early Massey lecturers included John Kenneth Galbraith and Martin Luther King Jr. In 1973, the CBC selected Stafford Beer.

Beer began by acknowledging "the systemic nature of the world," and proceeded to outline the ill-suitedness of contemporary modes of political organization to a "finite planet, with exhaustible resources."⁷¹ Beer did not advocate for top-down world government, but offered that reordering national governments on the principles of self-organization had the potential to remedy this "global mess":

In particular, I have expressed the view that the whole business of government, that gargantuan institution, is a kind of machine meant to operate the country in the interests of individual freedom. But ... it does not work very well—so that freedom is in question to a greater or lesser extent in every country of the world. So, I declared, let us redesign this "liberty machine" to be, not an entity characterized by more or less constraint, but a dynamic viable system that has liberty as its output.⁷²

"Viable system" was a term of art for Beer. A viable system must possess a degree of autonomy, reproduce itself, and adapt to changes in its environment.⁷³ Crucially, viable systems are self-organizing. In a 1965 article published in *Nature*, Beer described his approach to governance as "one which takes note of how the world is; it begins to construct a homomorphic model [a homeostat] which can be used for deliberative control."⁷⁴ The title of Beer's *Nature* article was "The World, the Flesh, and the Metal"—his commitment to a macrocosmic-microcosmic view of biological systems, the economy, homeostats, and the planet was unwavering. On air, Beer announced that his liberty machine's directive would be to administer a world economy that "works like our own bodies. There are nerves extending from the governmental brain throughout the country, accepting information continuously."⁷⁵

Building the liberty machine, of course, would be no small task. Beer readily admitted that the science of effective management through self-organization introduced the "concept of a force which affects everything on the planet," and that he had asked people to revise their "picture of the world."⁷⁶ But the future viability of the species, Beer insisted, would require confronting the fact that "institutions are supposed to be homeostatic" and that social scientists must work with, not in opposition to, the prerogatives of complex systems.⁷⁷

⁷¹Stafford Beer, *Designing Freedom* (Hoboken, 1995), 2–4.

⁷²*Ibid.*, 20.

⁷³Beer, *How Many Grapes Went into the Wine?*, 350.

⁷⁴Beer, "The World, the Flesh, and the Metal," 227.

⁷⁵Beer, *Designing Freedom*, 22.

⁷⁶*Ibid.*, 11.

⁷⁷*Ibid.*, 39.

Likewise, Quinn Slobodian has shown that the “Geneva school” neoliberals, chief among them Friedrich Hayek, fought during this period for international institutions that facilitated open trade and the power to enforce contracts—a framework to buffer the self-organizing world market from democracy. Hayek believed that regulating international trade was an enormous blunder. The realm of international affairs was of key importance to his thought and, in his view, rife with opportunity for liberalization. In 1944, on the eve of Bretton Woods, Hayek lamented,

In no other field has the world yet paid so dearly for the abandonment of nineteenth-century liberalism as in the field where the retreat began: in international relations. Yet only a small part of the lesson which experience ought to have taught us has been learnt. Perhaps even more than elsewhere current notions of what is desirable and practicable are here still of a kind which may well produce the opposite of what they promise.⁷⁸

Of course, the world economy underwent dramatic changes in the decades that followed. Reflecting on the neoliberal transformation of the 1970s, Hayek gushed in 1988 that the “only appropriate word” for the world market was “transcendent.” He wrote in *The Fatal Conceit* that the world market “far surpasses the reach of our understanding, wishes, purposes, and our sense-perceptions, and that which incorporates knowledge which no individual brain or any single organization could possess or invent.”⁷⁹

Organizing the world economy after the principles articulated at the 1960 Symposium was a possibility for Beer and Hayek because the category of the whole Earth was readily available—it was one node in the epistemic system that thinking self-organization required. In each theorist’s view, subterranean pathways of resemblance connected the Earth’s surface to the spontaneous order of the market and the emergent properties of biological life. Because their dimensions are greater than the sum of their parts, self-organizing materials easily slip the bonds of the firm, the national economy, and the state.

Concluding remarks

Hayek’s path crossed Beer’s a second time, out of joint, in Chile in the 1970s. In 1973, a military junta led by General Augusto Pinochet seized power and ejected Beer’s colleagues from the capital at rifle-point. Two weeks later, Heinz von Foerster sent Beer a telegraph which drew an analogy between the collapse of CYBERSYN and the recent death of von Foerster’s dear friend and colleague, Ross Ashby. “My dear Stafford, when our Ross died you cabled: ‘Our Ross is dead. Let us celebrate whatever immortality may mean.’ Your words are in my mind ever since our Chile died. Let us mourn mortality for what it is.”⁸⁰

⁷⁸Friedrich von Hayek, *The Collected Works of F.A. Hayek*, vol. 2, *The Road to Serfdom, Text and Documents*, ed. Bruce Caldwell (Chicago, 2007), 223.

⁷⁹Friedrich von Hayek, *The Fatal Conceit: The Errors of Socialism* (Chicago, 1988), 72.

⁸⁰Heinz von Foerster to Stafford Beer, 23 Sept. 1973, Heinz von Foerster Papers, Box 3, UIUC University Archives, Urbana, IL.

Beer used his CBC broadcast to draw attention to Pinochet's cruelty.

You all know what happened. On 11th September 1973, Salvador Allende died in a bloody business, of which the consequences for mankind are incalculable today. I tell you solemnly that in Chile the whole of humanity has taken a beating. Of the lessons from my own work [for President Allende] that emerge, I mention four. Firstly, it is actually possible to redesign the institutions of government according to the principles and practice of cybernetics. These are not wild dreams. Secondly, there is a long way to go in dismantling bureaucracy, and I shall discuss the problems of effecting change later in these talks. Thirdly, the possibilities propose an urgent task for our next meeting: to discuss the impact of such scientific advance as this on the status and freedom of the individual. So, I move to the fourth and final point for today. Individual freedom has been lost, momentarily at least, in Chile.

This was the irreconcilable difference between Hayek's thought and Beer's: Beer believed that subordinating politics to the exigencies of the market augured against individual liberty, and Hayek was convinced of precisely the opposite. In broad strokes, Beer favored economic centralization, which he took to be a precondition for political autonomy, and Hayek favored political centralization—a necessary measure to wrest power from organized labor and enforce his program for economic autonomy. Beer perceived that Pinochet's coup was a catastrophe for Chilean civil liberties. To Hayek, Allende's democratic socialism amounted to (in Greg Grandin's words) "a way station between Chile's postwar welfare state and a hypothetical totalitarian future."⁸¹ "It is possible for a dictator to govern in a liberal way," Hayek told a reporter for *El Mercurio* in 1982, "And it is also possible for a democracy to govern with a total lack of liberalism. Personally, I prefer a liberal dictator to democratic government lacking liberalism."⁸² First Beer, then later Hayek, realized their aims in Chile.

In 1977, Hayek embarked on a goodwill tour of Pinochet's Chile to pose for photographs with the general and give his imprimatur to the new regime's no-holds-barred "Chicago Boys" monetarism. By then, Pinochet's Chile had become a test case for a different sort of governance by self-organization. Scholars rightly think of Pinochet's coup as "a turning point in modern history, where free-market ideologues were able to first fully apply the neoliberal 'shock doctrine.'"⁸³ In 1980, Chile's military junta adopted a new constitution, which it touted as "la Constitución de la Libertad"—that is, "the Constitution of Liberty," the title of Hayek's 1960 book.⁸⁴

⁸¹Grandin, *Empire's Workshop*, 204.

⁸²"Extracts from an Interview with Friedrich von Hayek (El Mercurio, Chile, 1981)," *Punto de Vista Económico*, 21 Dec. 2016, at <https://puntodevistaeconomico.com/2016/12/21/extracts-from-an-interview-with-friedrich-von-hayek-el-mercurio-chile-1981>.

⁸³Grandin, *Empire's Workshop*, 84.

⁸⁴"¡Sí! a la constitución de la libertad," Museo de la Memoria y los Derechos Humanos, Archivos de Fondos y Colecciones, Box 944, Collection 5, Item 1, at www.archivomuseodelamemoria.cl/index.php/278487;isad.

In the preface to *The Fatal Conceit*, Hayek wrote,

When I began my work, I felt that I was nearly alone in working on the evolutionary formation of such highly complex self-maintaining orders. Meanwhile, researches on this kind of problem—under various names, such as autopoiesis, cybernetics, homeostasis, spontaneous order, self-organisation ... synergetics, systems theory, and so on – have become so numerous that I have been able to study closely no more than a few of them. This book thus becomes a tributary of a growing stream ...⁸⁵

The image of a branching stream is incongruous. Viewed from the perspective of the historian (downstream, facing backwards), Hayek's tributary becomes a torrent. A better analogy for the transformations that neoliberalism continues to undergo, William Callison and Zachary Manfredi have argued, is biological mutation. Mutations may be possible to trace backwards but are impossible to predict; they preserve characteristics of the parent but signal profound changes to the species.

"Indeed," Callison and Manfredi write, "the long history of neoliberal mutations indicates that opposing political positions can emerge from, or work within, an immanent relation to neoliberalism."⁸⁶ My aim has been to cast the events of 1973, and the violence and deprivation that ensued, as one such mutation. In the course of the neoliberal transformation, certain ideas changed hands but were not themselves transformed. Self-organization did not make neoliberalism; nor did neoliberalism make self-organization. Rather, in the 1970s, neoliberals took self-organization by force and successfully adapted it to their purposes. The aegis of self-organization was among the spoils of Pinochet's war on Chilean democratic socialism. Returning to Mulder's question, why ought historians afford theory a central role in their accounts of neoliberal transformation? Because economic theories may be the object of political contestation, if not the arrows with which these battles are fought.

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⁸⁵Hayek, *The Fatal Conceit*, 9.

⁸⁶William Callison and Zachary Manfredi "Introduction: Theorizing Mutant Neoliberalism," in Callison and Manfredi, eds., *Mutant Neoliberalism: Market Rule and Political Rupture* (New York, 2019), 1–38, at 9.

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